

Original Research Article

Effectiveness of health education in diabetes self-care: a quasi-experimental study in urban and rural populations

Pooja Todalabagi^{1*}, Manjula R.², Rachel S. Daniel¹

¹Department of Community Medicine, BLDE (DU) Shri BM Patil Medical College and Research Center, Vijayapura, Karnataka, India

²Department of Community Medicine, B.V.V. Sangha's S. Nijalingappa Medical College and HSK Hospital and Research Centre, Bagalkota, Karnataka, India

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*Correspondence:

Dr. Pooja Todalabagi,

E-mail: pooja.todalabagi@bldedu.ac.in

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ABSTRACT

Background: Diabetes mellitus is a chronic condition caused by insulin deficiency or ineffectiveness, requiring comprehensive self-care management. Effective self-care is essential to prevent complications and manage the disease effectively, particularly in addressing the challenges associated with lifestyle modifications.

Methods: This cross-sectional study assessed the impact of educational interventions on self-care management among urban and rural patients with diabetes. Conducted with 129 urban and 63 rural participants from the field practice areas of S. Nijalinappa Medical College, Bagalkot, data were collected using the diabetes self-management questionnaire. After administering a health education intervention, changes in self-care practices were evaluated.

Results: The study population included predominantly older males, with most participants identifying as Hindu (57% rural, 69% urban), married (85.7% rural, 82.9% urban), unemployed (44% rural, 35.7% urban), and illiterate (46.5% rural, 41.3% urban). Post-intervention, significant improvements were observed in diabetes self-care management in both urban and rural participants.

Conclusions: Educational interventions are instrumental in empowering individuals to adopt effective self-care practices and prevent complications associated with diabetes. Tailored health education programs focusing on self-care management are essential for addressing the unique needs of urban and rural diabetic populations.

Keywords: Self-care management, Type 2 diabetes, Educational interventions, Urban and rural health

INTRODUCTION

Diabetes mellitus (DM) represents a chronic metabolic disorder resulting from inherited or acquired deficiencies in insulin production or the diminished effectiveness of insulin action, necessitating lifelong management.¹ Within India, the prevalence of diabetes is staggering, currently exceeding 32 million cases, and is projected to reach 79.4 million by 2030.² This alarming increase has positioned type 2 DM as a critical global health issue, as it is intricately linked to severe complications, including cardiovascular diseases, nephropathy, retinopathy, and

neuropathy, all of which contribute substantially to chronic morbidity and mortality.³

Effective management of DM is heavily reliant on self-care, a multifaceted process encompassing adherence to prescribed medications, dietary regulation, consistent physical activity, blood glucose monitoring, and meticulous foot care.⁴⁻⁷ Developing and implementing reliable tools to evaluate self-management behaviours is imperative, as the evidence demonstrates that increased patient knowledge and active participation significantly mitigate disease progression and its associated complications.⁸⁻¹⁰

However, research highlights suboptimal self-care practices and treatment adherence in regions such as South India, underscoring the urgent need for context-specific interventions to enhance adherence and support patient engagement.¹¹⁻¹⁴

Diabetes self-management education (DSME) is essential to comprehensive diabetes care. DSME empowers individuals to prevent or delay complications, adopt healthier lifestyles, and develop effective coping mechanisms for managing their condition.¹⁵⁻¹⁹ Empirical evidence underscores the efficacy of DSME in reducing diabetes-related distress, bolstering self-efficacy, and positively influencing both behavioural and psychosocial outcomes.

The present study evaluates self-care activities among patients with type 2 DM through the diabetes self-management questionnaire. A comparative analysis will be conducted between urban and rural cohorts, followed by an educational intervention to evaluate its impact on self-care practices.

METHODS

Study area

The study was conducted in both rural and urban field practice areas attached to the Department of Community Medicine, S. Nijalingappa Medical College, Bagalkot, Karnataka. The rural health training center is located in Shirur (Shiva-Ganga Hospital) and serves a population of 19,119 through 20 Anganwadi. The urban health training center is 12 kilometers from the college, serving 19,508 people through 20 Anganwadi.

Study period

The study was conducted from June 2024 to December 2024.

Study design and participants

The study employed a Quasi-experimental design. Participants included 210 patients with type 2 DM, selected randomly from family registers maintained at the urban and rural health centers.

Sampling

A study conducted by Sasishekar et al estimated the prevalence of diabetic distress among individuals with type 2 DM to be 40%.¹⁰ Assuming a 50% reduction in diabetic distress following an educational intervention, the anticipated prevalence was calculated to be 20%.

$$\text{Sample size} = 2(z\alpha + z\beta)^2 p(1 - p)/d^2$$

Using the formula given, the required sample size was estimated to be 210 participants, accounting for a 15%

possible sample loss (170 + 15%). The urban and rural prevalence of diabetic distress was found to be 20% and 10%, respectively. Accordingly, the sample size was distributed proportionate to population size, with 140 participants recruited from the urban field practice area and 70 participants from the rural field practice area. Participants were selected randomly from family folders maintained at the respective health centers.

Inclusion and exclusion criteria

The study included patients diagnosed with type II DM (according to ADA and WHO guidelines) who had a history of diabetes for more than one year, were above 18 years of age, and provided informed consent. Patients were excluded if they had a history of diabetes for less than one year, had developed complications such as stroke, renal failure, cardiovascular diseases, or retinopathy, or if they were diagnosed with gestational diabetes.

Data collection

Baseline knowledge was assessed using a pretested questionnaire. Health education sessions were conducted monthly for six months, using audiovisual aids (e.g., PowerPoint presentations, flip charts, and handouts). Sessions included demonstrations of foot care practices. A post-test was administered after six months to assess changes in knowledge. Socio-demographic details, clinical parameters, and co-morbidities were also recorded.

Data analysis

The collected data was analyzed using the statistical package for social sciences (SPSS), version 26. Data was analyzed to compare pre-and post-intervention results, focusing on changes in knowledge and diabetic self-management behaviours, using validated scales. Quantitative analysis included statistical tests appropriate for comparing baseline and follow-up data.

RESULTS

The results of our study showed that out of 192 study participants, 129 participants (67%) were from urban areas, and 63 participants (33%) were from rural areas (Figure 1).

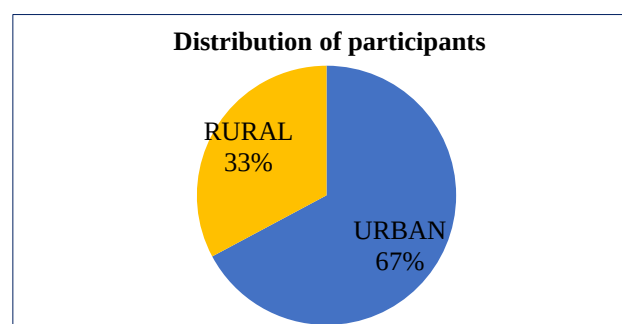
The majority of urban study participants, 55 (42.6%), belonged to the age group of 50 to 60 years, whereas among rural study participants, the majority, i.e., 23 (36.5%), were between 60 to 70 years. This indicates that the majority of study participants were old. Male predominance was observed in both urban and rural areas. Out of 129 urban study participants, 70 (54.3%) were males, and 59 (45.7%) were females. Among rural study participants, out of 63 participants, 44 (69.8%) were males, and 19 (30.2%) were females (Table 1).

Table 1: Socio-demographic distribution of participants.

Variables	Urban		Rural	
	Freq- uency	%	Freq- uency	%
Age (years)				
30-40	2	1.6	1	1.6
41-50	20	15.5	16	25.4
51-60	55	42.6	17	27.0
61-70	38	29.5	23	36.5
71-80	14	10.9	6	9.5
Gender				
Male	70	54.3	44	69.8
Female	59	45.7	19	30.2
Religion				
Hindu	89	69.0	57	90.5
Muslim	32	24.8	5	7.9
Others	8	6.2	1	1.6
Marital status				
Single	1	0.8	00	00
Married	107	82.9	54	85.7
Widow	21	16.3	9	14.3
Occupation				
Housewife	40	31.0	06	9.5
Farm owners	4	3.1	10	15.8
Unskilled	2	1.6	02	3.2
Professional	1	0.8	01	1.6
Shop-owners	1	0.8	03	4.8
Skilled	11	8.5	10	15.9
Semi-Skilled	18	13.2	01	1.6
Semi-professional	7	5.4	02	3.2
Unemployed	46	35.7	28	44.4
Education				
Illiterate	60	46.5	26	41.3
Primary	35	27.1	12	19.0
High-school	20	15.5	10	15.9
PUC	4	3.1	03	4.8
Diploma	5	3.9	6	9.5
Graduate	5	3.9	6	9.5
Socio-economic status				
Class I	10	7.8	11	17.5
Class II	17	13.2	19	30.2
Class III	29	22.5	5	7.9
Class IV	30	23.3	22	34.9
Class V	43	33.3	6	9.5
Total	129	100	63	100.0

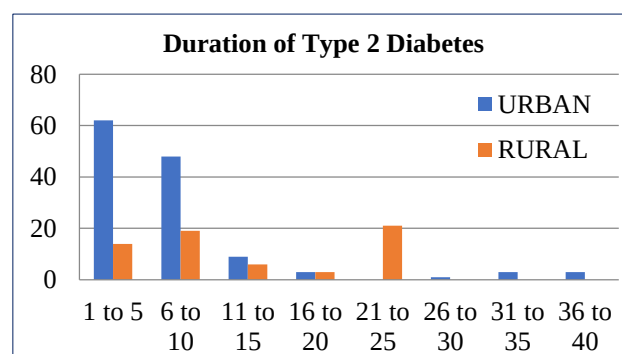
When analyzed by religion, the majority of participants in both urban and rural areas identified as Hindu. Specifically, 89 (69%) of urban participants and 57 (90.5%) of rural participants reported Hinduism as their religion. Marital status analysis showed that most participants were married. Among urban participants, 107

(82.9%) were married, while in the rural cohort, 54 (85.7%) were married (Table 1).

**Figure 1: Area distribution of participants.**

The analysis of occupation revealed that 46 (35.7%) of urban participants were unemployed, while 28 (44.4%) of rural participants were also unemployed. A significant portion of the study population comprised elderly individuals who were not engaged in any form of work. Among the 129 urban participants, 60 (46.5%) were illiterate, whereas in the rural group, 26 (41.3%) of the 63 participants were illiterate. Regarding socio-economic status, as determined by the modified B.G. Prasad's classification, the largest proportion of urban participants, 43 (33.3%), fell into class V. In the rural cohort, the majority, 22 (34.9%), were classified as belonging to class IV (Table 1).

Among the 129 urban participants, the largest proportion, 62 (48.1%), reported having diabetes for five years. Conversely, in the rural cohort, 21 out of 63 participants (33.3%) reported living with diabetes for 21 to 25 years. These findings highlight differences in the duration of diabetes between urban and rural populations (Figure 2).

**Figure 2: Distribution of study participants based on duration of diabetes.**

The diabetic self-management questionnaire (DSMQ) was assessed among urban participants, revealing that a significant majority, 116 (89.9%), initially had poor scores, defined as a range between 0 and 3. After undergoing health education interventions, the proportion of participants with satisfactory scores increased to 89 (69%). Similarly, DSMQ scores were evaluated among rural

participants. Initially, 47 (74.6%) had poor scores within the same range (0 to 3). However, after receiving health education, 46 (73%) of rural participants improved to achieve satisfactory scores. These results underscore the effectiveness of health education in enhancing diabetes self-management in both urban and rural populations (Table 2).

The impact of an educational intervention on diabetes self-care management, as assessed by the DSMQ scores for urban and rural participants. Among urban participants, the mean pre-intervention DSMQ score was 1.12 (SD=0.39), which increased to 1.95 (SD=0.56) after the intervention. This change reflects a significant improvement in self-care practices, with a t-value of -14.212 and a highly significant p value of 0.00 ($p < 0.05$). Similarly, rural participants showed an improvement in their DSMQ scores, with the mean score rising from 1.29 (SD=0.52) pre-intervention to 1.92 (SD=0.51) post-intervention. The t-value for this group was -7.420, and the p value was 0.00, indicating a statistically significant enhancement in self-care management. These findings demonstrate that the

educational intervention was effective in improving diabetes self-care practices in both urban and rural populations, with urban participants showing a greater relative increase from their lower baseline scores (Table 3).

Table 2: Distribution of urban and rural study participants based on diabetic self-management questionnaire score.

Variables	Pre-intervention		Post-intervention	
	Freq- uency	%	Freq- uency	%
DSMQ urban				
Poor	116	89.9	23	17.8
Satisfactory	10	7.8	89	69.0
Good	3	2.3	17	13.2
DSMQ rural				
Poor	47	74.6	11	17.5
Satisfactory	14	22.2	46	73.0
Good	02	3.2	06	9.5
Total	129	100.0	129	100.0

Table 3: Comparison of DSMQ score in urban and rural participants pre and post intervention.

Diabetic self-management questionnaire score	Pre-intervention		Post-intervention			P value
	Mean	SD	Mean	SD	t	
Urban participants	1.12	0.39	1.95	0.56	-14.212	0.00*
Rural participants	1.29	0.52	1.92	0.51	-7.420	0.00*

*-A paired t-test is applied, and $p < 0.05$ is taken as a significant

DISCUSSION

In our study, most urban participants (42.6%) were in their 50s and 60s, while rural participants (36.5%) were in their 60s and 70s. This trend mirrors findings by Mohandas et al who reported 35.1% of diabetic patients in the 60–69 age group, and Buksha et al who noted a concentration of cases in the 45–60 age range.^{20,21} Devarajooh et al further highlighted a mean age of 55.33 years among their study population.²² These results underline the higher prevalence of diabetes among older adults, reflecting age-related risks and comorbidities.

The present study identified a higher proportion of male participants in both urban (54.3%) and rural (69.8%) areas. This finding aligns with Dedefo et al who reported 54.8% male participants, and Raithatha et al where men constituted 53% of the study group.^{23,24} However, contrasting studies by Mohandas et al and Hemavathi Dasappa et al found a female predominance. Such discrepancies could result from cultural and regional differences affecting healthcare-seeking behaviors and disease detection.^{20,25}

The majority of participants in our study were married, with rates of 82.9% in urban and 85.7% in rural areas. Comparable figures were reported by Raithatha et al where 78% of participants were married, and Kalusivalingam et

al who documented a marriage rate of 96.2%. This suggests that marital status often provides support systems that influence disease management and adherence to treatment regimens.^{19,26}

High illiteracy rates were observed in our study, with 46.5% of urban and 41.3% of rural participants lacking formal education. Similarly, Hemavathi Dasappa et al reported that 43.55% of participants were uneducated.¹⁸ Buksh et al found 22% without formal education, while Saleh et al noted 41% had completed high school.^{21,27} These results demonstrate the critical link between education and effective diabetes management, as better-educated individuals are more likely to adhere to self-care practices.

Unemployment rates were significant, with 35.7% in urban and 44.4% in rural areas. Hemavathi Dasappa et al reported even higher rates of 62.57% unemployment, and Karthik et al noted 72.4% unemployment in rural Tamil Nadu.²⁸ Unemployment can limit access to healthcare and resources needed for effective diabetes management, underscoring the socioeconomic challenges faced by diabetic patients.

This study found that 48.1% of urban participants had diabetes for less than five years, while 33.3% of rural participants had diabetes for 21–25 years. Similar results

were reported by Buksh et al, with 49.5% having diabetes for less than five years, and Hemavathi Dasappa et al, who observed 65.64% in this category.^{21,25} Conversely, Karthik et al reported that 62% of rural participants had diabetes for over five years, emphasizing differences in disease progression and management based on geography and healthcare accessibility.²⁸

Pre-intervention results showed poor self-care scores in 89.9% of urban and 74.6% of rural participants. Similar findings were reported by Kishore et al, Goyal et al, and Chandrika et al, all of whom highlighted low adherence to self-care practices.²⁹⁻³¹ Post-intervention, self-care scores improved significantly, with 69% of urban and 73% of rural participants achieving satisfactory scores. Studies by Saleh et al and Salahshouri et al similarly demonstrated the effectiveness of targeted health education in improving self-care behaviours.^{27,32} This was due to the educational sessions providing participants with essential information about diabetes, its complications, and the significance of self-care activities such as monitoring blood sugar levels, adhering to a healthy diet, regular physical activity, and medication adherence.

Limitations

The study was conducted in field practice areas attached to a single medical college in Bagalkot, Karnataka. This restricts the applicability of the results to other regions.

The study relied on self-reported measures, so are subject to recall and social desirability biases, potentially affecting the accuracy of the results.

CONCLUSION

Diabetes mellitus is a chronic condition that profoundly affects multiple systems in the body, requiring patients to adapt to significant lifestyle changes. The present study highlights the poor self-care practices, particularly in North Karnataka's urban and rural populations. The study emphasizes that structured educational interventions play a pivotal role in bridging gaps in diabetes self-management, reducing the risk of complications, and improving the overall quality of life for patients.

Recommendations

Organize health education programs in communities to raise awareness about the chronic nature of diabetes and the importance of early management.

Encourage patients to adopt self-care activities as part of their daily routine, emphasizing their role in effective diabetes management.

The importance of proper foot care to prevent complications and halt the progression of diabetes-related issues.

Educate patients on the benefits of consuming small, frequent meals to maintain stable blood glucose levels and improve metabolic control.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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